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REMARKS

Claims 1, 3, 6, 9-13, 15, 18, and 21-33, are pending in this application. Applicants have made several amendments to the claims in this Response. Applicants believe these amendments serve a useful clarification purpose, and are desirable for clarification purposes, independent of patentability. Accordingly, Applicants respectfully submit that the claim amendments do not limit the range of any permissible equivalents.

In particular, claims 10, 27, and 31 have been rewritten to correct minor grammatical issues with the claims. In addition, claims 1, 13, and 22 have been rewritten to overcome the 35 U.S.C. § 112 rejections.

As no new matter has been added by the amendments herein, Applicants respectfully request entry of these amendments at this time.

THE REJECTIONS UNDER 35 U.S.C. § 112

Claims 1, 3, 6, 9-12, 13, 15, 18, 21-33 were rejected under 35 U.S.C. § 112, first paragraph, as not enabled for the reasons set forth on pages 3-4 of the Office Action. In addition, the Examiner rejected claims 1, 3, 6, 9-12, 13, 15, 18, and 21-33 under § 112, second paragraph, as indefinite as explained on pages 4-5 of the Office Action.

Claims 1, 13, and 22 have been rewritten to address the language of concern to the Examiner. As discussed below, however, Applicants respectfully disagree with the Examiner's reasons for the remaining rejections.

The Term "Normally Accepted" Is Enabled and Adequately Described

As known to those of ordinary skill in the art, alloys generally contain small amounts of impurities. As such, skilled artisans are well aware of the levels of impurities that are "normally accepted" in alloys such as the one presently recited. In addition, the Written Description itself refers to European Patent No. 0 674 800 as an exemplar of a publication discussing the normally acceptable impurities levels, which are suitable in the presently recited alloy of the invention. *See, e.g.*, Page 7, lines 27-29.

And, even assuming *arguendo* that one of ordinary skill in the art is not aware of the normally accepted levels of impurities for alloys, one would be aware that he or she should consult a standard that defines acceptable impurity levels in alloys. For example, ASTM

standard B 349-93, a copy of which is included for the Examiner's reference, outlines the standard for impurity levels for zirconium sponge.[1]

Accordingly, Applicants respectfully submit that the term "normally accepted" is enabled and that one of ordinary skill in the art, after reading the Specification, would be aware of how to make and how to use the invention, as presently recited.

"Second Degree of Recrystallization Is 100%" Is Enabled and Adequately Described

Applicants respectfully submit that the phrase "wherein the second degree of recrystallization is 100%" is adequately described and enabled. In fact, those of ordinary skill in the art are aware of methods of investigation to determine whether a complete or partial recrystallization has occurred. For example, optical metallography, discussed in greater detail in previously cited document U.S. Patent No. 4,993,136 to Foster ("Foster") at Col. 7, lines 15-16, may be used to determine the degree of recrystallization. In addition, transmission electron microscopy, which enables one to observe individual grains of a material and ascertain the percentage of grains that are substantially free from dislocations, may also be used to determine the degree of recrystallization. In particular, if 80 percent of the grains are substantially free of dislocations, then the degree of recrystallization is 80 percent. Likewise, if all the grains are substantially free of dislocations, then the recrystallization is complete. The statistical accuracy of such an analysis depends on the number of specimens, however, a skilled artisan would be well aware of the steps to perform such an analysis.

Furthermore, those of ordinary skill in the art are well aware of the terms "complete recrystallization" or "fully recrystallized" and, thus, would not find the phrase "wherein the second degree of recrystallization is 100%" not adequately described nor enabled. For example, Foster describes such degrees of recrystallization. *See* Col. 6, lines 66-67.

For at least these reasons, Applicants respectfully submit that the presently recited degree of recrystallization is enabled and adequately described.

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[1] Although the requirements could differ slightly between various standards bodies, the ASTM standard is the normally accepted standards body. Moreover, Applicants respectfully submit that, to comply with 35 U.S.C. 112, first paragraph, it is not necessary to "enable one of ordinary skill in the art to make and use a perfected, commercially viable embodiment absent a claim limitation to that effect." *CFMT, Inc. v. Yieldup Int'l Corp.*, 349 F.3d 1333, 1338 (Fed. Cir. 2003) (an invention directed to a general system to improve the cleaning process for semiconductor wafers was enabled by a disclosure showing improvements in the overall system).

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In sum, Applicants respectfully submit that the rejections under § 112, first and second paragraphs, are overcome either by amendment or argument. As such, reconsideration and withdrawal of the § 112 rejections are respectfully requested.

CONCLUSION

All claims are believed to be in condition for allowance. If the Examiner believes that the present amendments still do not resolve all of the issues regarding patentability of the pending claims, Applicants invite the Examiner to contact the undersigned attorneys to discuss any remaining issues.

No fees are believed to be due at this time. Should any fee be required, however, please charge such fee to Hanify & King, P.C., Deposit Account No. 50-4545, Order No. 19378.0089.

Respectfully submitted,

HANIFY & KING, P.C.

Dated: April 8, 2008

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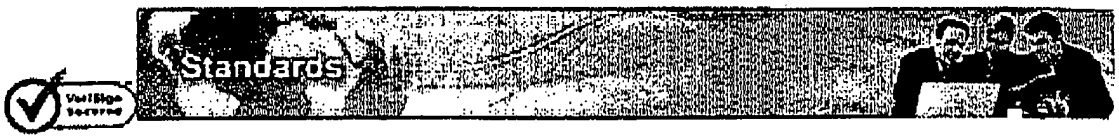

ASTM B349/B349M-03 Print

ASTM B349/B349M-03 Standard Specification for Zirconium Sponge and Other Forms of Virgin Metal for Nuclear Application

Developed by Subcommittee: B10.02 |**Book of Standards Volume:** 02.04

Buy Standard (PDF)	more info	3 pages	$ 31.00
Buy Standard (Print)	more info	3 pages	$ 31.00
Buy Standard + Redline (PDF)	more info	6 pages	$ 37.20

1. Scope

1.1 This specification covers one grade of virgin zirconium metal commonly designated as sponge because of its porous, sponge-like texture, but it may also take other forms such as chunklets.

1.2 The one grade described is designated as Reactor Grade R60001, suitable for use in nuclear applications. The main characteristic of the reactor grade is its low nuclear cross section as achieved by removal of hafnium. The manufacturer must use procedures to prevent contamination with other high cross-section materials.

1.3 Unless a single unit is used, for example corrosion mass gain in mg/dm², the values stated in either inch-pound or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore each system must be used independently of the other. SI values cannot be mixed with inch-pound values.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

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Index Terms

nuclear; virgin zirconium metal; zirconium sponge; ICS Number Code 27.120.99; 77.120.99; 77.150.99

Citing ASTM Standards

Designation: B 349 – 93

Standard Specification for Zirconium Sponge and Other Forms of Virgin Metal for Nuclear Application[1]

This standard is issued under the fixed designation B 349; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers virgin zirconium metal commercially designated as sponge because of its porous, sponge-like structure, but it may also take other forms such as crystals.

1.2 One grade is described which is designated as Reactor Grade R60001, suitable for use in nuclear application. The important characteristic of the reactor grade is its low neutron cross section as achieved by removal of hafnium and through quality control in manufacturing procedures to minimize in combination with other high cross-section metallic impurities.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[2]

3. Ordering Information

3.1 Purchase orders for material under this specification should include the following information, as required, to describe adequately the desired material:

3.1.1 Quantity,

3.1.2 Form of material,

3.1.3 Grade designation, and

3.1.4 ASTM designation and year of issue.

For example, ordering description is as follows: 3000 lb sponge Grade R60001, ASTM Specification B 349 – —.

3.2 In addition to the data specified in 3.1, the following options of agreement between the manufacturer and purchaser shall be specified in the purchase order, if required:

3.2.1 Packaging (Section 14), and

3.2.2 Evaluation samples (see 6.2).

4. Material Manufacture

4.1 The material is usually prepared by reduction of zirconium tetrachloride, and gets its physical characteristics from the processes involved in production. These characteristics may be expected to vary greatly with manufacturing methods. This specification, however, is not limited to metal prepared by reduction of tetrachlorides or to material of any specific physical form.

4.2 Only virgin zirconium metal, in identified, uniform, well-mixed blends, shall be supplied under this specification.

5. Chemical Composition

5.1 The zirconium metal supplied under this specification shall conform to the requirements for chemical composition prescribed in Table 1.

6. Sampling

6.1 A blend of sponge shall be sampled by running a full quantity through a proportioner or splitter to obtain a representative sample of at least 1 % of the blend weight. The method for splitting this sample and preparing an evaluation ingot and compacted briquette shall be agreed upon between the manufacturer and the purchaser. One such method is by splitting using a Jones riffle.

6.1.1 The evaluation ingot shall be greater than 30 lb (14 kg).

6.1.2 The compacted briquette shall be at least 1 lb (0.5 kg).

6.2 When specified in the purchase order, a duplicate sample or portions of the briquette and evaluation ingot shall be supplied to the purchaser.

7. Methods of Chemical Analysis

7.1 *Preparation of Sample:*

7.1.1 Compact the evaluation ingot sample taken in accordance with Section 6 into a consumable electrode and melt to ingot form in an arc furnace of a type conventionally used for reactive metals. The ingot shall be prepared for analysis by either of the following two methods:

7.1.1.1 Take a longitudinal section through the center of the ingot. Sample this section and analyze by appropriate means at a minimum of three places in approximately equal intervals diagonally from the top to the bottom of the section.

7.1.1.2 Samples for chemical tests shall be taken from solid metal below the surface porosity of the as-cast ingot. The samples shall be taken from a minimum of three places equally spaced along the axial length of the ingot.

7.2 Analytical samples for the determination of chlorine must be taken from the sponge, since this constituent is volatilized in melting. Obtain this sample by drilling a compacted sample of the sponge or chiplets. Sample the briquette by drilling, without water or other lubricant, a minimum of three holes, each ¾ in. (9.53 mm) or larger in

[1] This specification is under the jurisdiction of ASTM Committee B-10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.02 on Zirconium and Hafnium.

Current edition approved June 15, 1993. Published September 1993. Originally published as B 349 – 60. Last previous edition B 349 – 80 (1987).

[2] *Annual Book of ASTM Standards*, Vol 14.02.

TABLE 1 Chemical Requirements of Zirconium Sponge, Reactor Grade R60001

Element	Permissible Impurities, max, ppm
Aluminum	75
Boron	0.5
Cadmium	0.5
Carbon	250
Chlorine	1300
Chromium	200
Cobalt	20
Copper	50
Hafnium	100
Iron	1500
Magnesium	80
Molybdenum	50
Nickel	70
Nitrogen	90
Oxygen	1400
Silicon	120
Tungsten	50
Vanadium	60
Uranium (total)	3.0

diameter, at equal intervals on a circle, concentric with the rounded surface of the briquette. Reject drillings until the flutes of the drill are ¼ in. (6.35 mm) below the surface of the briquette. Take the sample drillings from this point until the point of the drill is within ¼ in. of the opposite surface of the briquette. Crush drillings taken in this manner to pass a No. 4 (4760-μm) sieve and thoroughly mix.

7.3 Analyze one of the samples taken in accordance with 7.1.1 for its uranium content. Analyze all samples taken in accordance with 7.1.1 for all elements listed in Table 1 except for chlorine and uranium.

7.4 *Analysis*—Analysis shall be made using the manufacturer's standard methods. In the event of disagreement as to the chemical composition of the metal, chemical analysis for referee purposes shall be determined by a mutually acceptable laboratory. The average of the analyses for each impurity shall conform to the requirements of this specification, with no individual value greater than 30 % above the maximum specified limit for that impurity. Practice E 29 shall be used to establish significant digits.

8. Particle Size

8.1 Zirconium sponge supplied under this specification shall pass a 1 in. (25.4 mm) screen and shall contain less than 2 %–20 mesh particles.

9. Retest

9.1 If any sample or specimen exhibits obvious contamination, or improper preparation, or flaws which disqualify it as a representative sample, the sample shall be discarded and a new sample or specimen substituted.

10. Rejection

10.1 Rejection for failure of the material to meet the requirements of this specification shall be reported to the manufacturer within 60 calendar days from the receipt of the material by the purchaser. Unless otherwise specified, rejected material may be returned to the manufacturer at the manufacturer's expense, unless the purchaser receives within three weeks of the notice of rejection, other instructions for disposition.

11. Referee

11.1 In the event of disagreement between the manufacturer and the purchaser on the conformance of the material to the requirements of this specification or any special tests specified by the purchaser, a mutually acceptable referee shall perform the tests in question. The results of the referee testing shall be used in determining conformance of the material to this specification.

12. Certification

12.1 The manufacturer shall supply at least one copy of his analytical test results of chemical analysis and hardness tests on each lot or blend of material supplied. When quantities smaller than the manufacturer's standard blend quantity are supplied, the blend analysis shall be considered representative of the lot.

13. Product Marking

13.1 The containers shall be legibly and permanently marked with the following information:

13.1.1 Purchase order number,
13.1.2 Name of material,
13.1.3 Particle size range,
13.1.4 Net weight,
13.1.5 ASTM designation, and
13.1.6 Date packed.

14. Packaging and Package Marking

14.1 The method of packaging shall be as agreed upon by the manufacturer and the purchaser. Packaging shall be such as to insure safe delivery when shipped by any common carrier. The size and nature of the containers used are generally determined by the time and length of storage and the amount of handling involved. Where fire hazards or sponge deterioration during prolonged storage are primary considerations, zirconium sponge should be packed in air-tight, moisture-proof, sealed metal cans or drums which have been backfilled with argon.

15. Keywords

15.1 nuclear; virgin zirconium metal; zirconium sponge

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